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their studies, their marriage and the beginning of their careers. I described my home, the lakes, drives, and always my study. There was never any break. The story flowed right on, and if my attention was called away, I was always uneasy until I could begin again to weave it. I would always lie awake as long as I could, after going to bed, to work on it. I always brought my friends in and provided well for them.

"At the age of fourteen, I began to read the lives of men like Webster, Clay, Lincoln, etc. Then the story changed. My education was such as fitted me for an orator and statesman. I always became governor of my state, congressman, senator, and finally president. Every step and all my relations to friends were minutely described. I usually ended up by becoming president of a World's Congress of Peace. As soon as I had died I always started another story."

## II.—SYNÆSTHESIA.<sup>1</sup>

BY MARY WHITON CALKINS.

The study of the varying forms of persisting abnormal association, usually known as "colored-hearing" and "forms," but grouped together by Theodore Flournoy, under the convenient name *Synæsthesia*, has hardly, as yet, completed the stage of scientific observation. The physiologists, with their guesses of intertwined nerve fibres, and Mr. Myers, with his prompt application of the subliminal consciousness theory, are avowedly dealing with unverified hypotheses; on the other hand, the reports of particular cases are apt to overlook the ordinary forms of the phenomenon and to disregard the frequency of the experience. For the purpose, then, of a wide yet careful survey of these phenomena of consciousness, assuming no certainty of any important theoretical outcome, it has seemed worth while to continue the statistical study of synæsthesia begun two years ago at Wellesley College. The investigation has the advantage of reaching a large number of individuals of the same sex and of about the same age, but coming from different localities and homes. The artificiality of many statistical inquiries has been avoided so far as possible, by making the questions both concrete and simple. Some of the questions of the former study<sup>2</sup> are here not at all considered, either because of the practical unanimity of the earlier

<sup>1</sup>A continuation of the Wellesley College Study of Colored-Hearing and of Forms.

<sup>2</sup>"A Statistical Study of Pseudo-chromesthesia and of Mental Forms." AMERICAN JOURNAL OF PSYCHOLOGY, Vol. V, 4.

answers or because of the difficulty of gaining accurate replies.

The most general, positive conclusion of the study is the virtual demonstration of the stability of the experience. Nearly two hundred persons, questioned a second time, usually a year, always several months after the first inquiry, and without previous intimation of this verification, have been found, with only one exception, to possess the photisms or the forms at the end as at the beginning of the time, and in the same general form of the mental habit. Often the shades of color and the turns of the forms are exactly the same; in other cases, slight changes or omissions in the list of colors, or altered curves in the forms, show a close connection between colors or forms and the intervening experience of the subject, but in general type the phenomenon is an abiding one. This proof in the case of the first two canvasses of the constancy of the synæsthesia, has made it possible to omit in the last investigation the tedious process of verification, except in reference to letter-color, in which changes seem especially often to occur.

The only particular in which the results of the three canvasses seem to contradict each other is with regard to the prevalence of synæsthesia, whose per cent. of occurrence increases with each year's report. In the summary which follows, *P.* represents photisms (that is, cases of pseudo-chromesthesia); *F.* stands for forms, and includes those forms for single words, figures and objects, which Mr. Flournoy names symbols; *D.* designates not only the explicit dramatization of letters and numerals, but cases of particular fondness for especial ones; the figures under this head are given only for 1894, since in 1892 the questions were not asked, while in 1893 they were inexactly formulated.

The larger per cents. are far more likely to represent the actual frequency of synæsthesia, for the reason that the proportion increases exactly in accordance with the increasing care of the investigation. The first canvass attempted too much in trying to reach the whole college, and among the 200 who failed to respond there certainly were many who avoided the questioners in order to rid themselves of the troublesome necessity of answering. In 1893 every member of the freshman class was questioned, but the preliminary inquiry was by circular, and the traditional objection to answering statistical inquiries may be responsible for many careless, negative replies. In 1894 the class was addressed, the purpose of the investigation was explained, and the preliminary questions were answered before the students left the room. The more detailed inquiry was made either by circu-

SUMMARY I.  
*Frequency of Synæsthesia.*

| Cavass<br>of | Subjects with <sup>1</sup> |               |               | Subjects with <sup>2</sup> |                          |                   | Total<br>Subjects with<br>Synæsthesia. | Subjects<br>with no<br>Synæsthesia. | Total<br>Subjects. |
|--------------|----------------------------|---------------|---------------|----------------------------|--------------------------|-------------------|--|-------------------------------------|--------------------|
|              | P.                         | F.            | D.            | P. & F.<br>(& D.)          | Other Com-<br>binations. | P. or F.<br>or D. |  |                                     |                    |
| '92          | 35 (= 6.66%)               | 65 (= 12.38%) |               | 18                         |                          | 64                | 82 (= 15.61%)                          | 443                                 | 525                |
| '93          | 36 (= 16.82%)              | 56 (= 26.16%) |               | 23                         |                          | 48                | 71 (= 33.17%)                          | 143                                 | 214                |
| '94          | 56 (= 23.33%)              | 115 (= 47.5%) | 83 (= 34.58%) | 38                         | 45                       | 62                | 145 (= 60.41%)                         | 95                                  | 240                |
| Total        |                            |               |               | 79                         | 45                       | 174               | 298                                    | 681                                 | 979                |

<sup>1</sup>The figures under this heading can not be counted towards the total, because the same subject may be represented in more than one column.

<sup>2</sup>In the figures under this head each subject is represented but once; the sum of these figures makes up the total.

lar or by personal interview. The investigation will be continued for several years, in order to obtain more material for decision, but at its present stage it seems to justify the opinion that of every ten persons five at least have some peculiar, fixed form of mental imagery, and that of these five two are likely to have photisms<sup>1</sup> and four to possess some mental form, while three must admit some other kind of apparently erratic association.

It is fair to add the figures of a canvass with very different results. Miss L. A. Williams questioned about 250 pupils of the Trenton, N. J., Normal School. Of these about ten per cent. were young men, and the average age of all was a little under eighteen. Only five cases (2 per cent.) of colored-hearing and six cases (2.4 per cent.) of forms were found. I can explain this proportion, so much less than that of any other computation, only by reference to two facts: that 110 of the subjects "answered the questions hastily in time taken from other work;" and that some indications of the tendency "were not reported." Yet this report of a careful observer is certainly worthy of consideration.

A canvass among older people might, also, yield different results, but it should be observed that few of our subjects are conscious of any lessening of the experience. This is shown by

SUMMARY II.<sup>2</sup>

|       | INCREASE. |   |        | DECREASE. |   |        | Neither | Both | No Ans. | Total.           |
|-------|-----------|---|--------|-----------|---|--------|---------|------|---------|------------------|
|       | Sure.     | ? | Total. | Sure.     | ? | Total. |         |      |         |                  |
| P.    | 20        | 8 | 28     | 14        | 1 | 15     | 42      | 0    | 7       | 92 <sup>3</sup>  |
| F.    | 38        | 6 | 44     | 12        | 4 | 16     | 90      | 4    | 17      | 171 <sup>3</sup> |
| Total |           |   | 72     |           |   | 31     | 132     | 4    | 24      | 263              |

The general character of the cases of synæsthesia appears from the following classifications :—

<sup>1</sup>Cf. Galton, Bleuler u. Lehmann and Flournoy for much lower estimates:— $\frac{1}{8}$  and  $\frac{1}{6}$ .

<sup>2</sup>This summary, like all those which follow, considers only the records of 1893 and 1894.

<sup>3</sup>92 is the number of subjects who have photisms; 171 is the number of those who have forms; evidently the same subject may be represented in both totals.

## SUMMARY III.

*Varieties of Forms.*

|                    | Sure. | ? | Total. |
|--------------------|-------|---|--------|
| Month-forms,       | 141   |   | 141    |
| Number-forms,      | 119   |   | 119    |
| Day-of-week forms, | 105   |   | 105    |
| Century-forms,     | 48    | 1 | 49     |
| Other forms,       | 95    | 1 | 96     |
| Total forms,       | 508   | 2 | 510    |

These records, therefore, corroborate the earlier ones with regard to the order of frequency of the different forms. Month-forms lead, closely followed by number forms. Under the name "other forms" are grouped alphabet-forms; a few hour-forms; a form distinct from the number-form, which progresses from the decimals through units, tens, hundreds and the like to dexillions; a form for sharps and flats in music; two prayer forms, one for the Lord's prayer and one with a variable curve at the end, which alters with the changing character of the original petitions; and finally several symbols for places, months and numerals, with one irregular, closed curve, representing a "sudden shriek."

## SUMMARY IV.

*Varieties of Pseudo-chromesthesia.*

| With.                                | Sure. | ? | Total. |
|--------------------------------------|-------|---|--------|
| Letters { Vowels only in 10 cases. } | 43    | 1 | 44     |
| Consonants only in 4 cases. }        |       |   |        |
| Both, in 30 cases. }                 |       |   |        |
| Words,                               | 72    |   | 72     |
| Music,                               | 63    | 1 | 64     |
| Numerals,                            | 14    |   | 14     |
| Odors,                               | 1     |   | 1      |
| Tastes,                              | 6     | 2 | 8      |
| Touches,                             | 6     | 2 | 8      |
| Pain,                                | 1     |   | 1      |
| Total forms of psuedo-chromesthesia, | 206   | 6 | 212    |

The frequency of consonant-color still far exceeds that of Galton's and of Flournoy's subjects. The latter<sup>1</sup> reports 46 subjects with consonant-color to 247 with vowel-color (554 to 1,076 single cases); while this Wellesley table gives 34 subjects and 225 cases of consonant-color to 40 subjects and 134 cases of vowel-color. No table of colors is given, because not all the records have been verified. The result, however, of these records and a study of all the attempted reductions of letter-color to any rule, lead almost inevitably to the conclusion that the associations vary freely with different

<sup>1</sup>Flournoy, "Des Phénomènes de Synopsis," pp. 90-91.

subjects. Even Flournoy's modest "loi de clarté"<sup>1</sup> finds no corroboration in our records.

The noticeable frequency of i = black and o = white, in the 1892 records, fades to a mere preference for these associations over any other (9 in 26 cases of i = black or "dark," 10 in 28 cases of o = white or "pale"). On the other hand, most of the cases of music-color conform to the well-established rule: photisms for the high notes are light and those for the low notes are dark.

Detailed questions were asked, to discover, if possible, different photisms for different sounds of the same vowels, but the answers disclose a general sameness of color, with occasional changes in shade for the photisms of the long and short sounds of the same vowel. This seems to show a less common connection than is often supposed between the sound of a letter or a word and the color. This conclusion, however, is of doubtful value, for when once the letter is learned, its different sounds and shapes are almost indissolubly connected,<sup>2</sup> so that the color of the most important vowel-sound might conveniently stand for the letter as a whole, for every form as well as for every sound of it, even displacing previous photisms with the other sounds. The prominence of sound-color over sight-color, but the likelihood that both the sound and the appearance, which are parts of the complex letter-consciousness, are effective in the association, are shown by

# SUMMARY V.

## *Connection of Color with Sound and with Shape.*

| COLOR, WHEN LETTER, WORD, MUSIC, ETC., IS |   |              |   |       |   |         |
|---|---|--------------|---|-------|---|---------|
| Heard (only).                             |   | Seen (only). |   | Both. |   | No Ans. |
|   |   |              |   |       |   | Total.  |
| 28  | 9 | 3            | 3 | 56    | 5 | 5       |
|   |   |              |   |       |   | 92      |

The figures in the right hand columns indicate cases which are not counted in the totals, because represented in still another column. This occurs when different photisms of the same subject are occasioned by different stimuli.

The remaining results of the study of pseudo-chromesthesia are grouped together, with reference to their bearing on the attempted explanation of the experience. From these records

<sup>1</sup>*Op. cit.*, p. 66.

<sup>2</sup>*Cf. Flournoy, op. cit.*, pp. 48-49.

it is clear that some, at least, of these photisms must be explained as due to natural associations. The instances in which these explanations are definitely given are summarized below.

SUMMARY VI.  
*Explanation of Pseudo-chromesthesia.*

| Nature of<br>Pseudo-chromesthesia.          | THE EXPLANATION IS         |         |         |               |       |               | Total<br>Expla-<br>nations. | No<br>Expla-<br>nations. | No<br>Ans. | Total<br>Cases. |
|---|----------------------------|---------|---------|---------------|-------|---------------|-----------------------------|--------------------------|------------|-----------------|
|   | THROUGHACT.<br>OCCURRENCE. |         | EMOT'L. |               | BOTH. |               |                             |                          |            |                 |
|   | Full.                      | Partial | Full.   | Par-<br>tial. | Full. | Par-<br>tial. |                             |                          |            |                 |
| Letter-color,                               | 2                          | 3       | 0       | 0             | 0     | 0             | 5                           | 28                       | 11         | 44              |
| Word-color,                                 | 12                         | 12      | 4       |               | 8     | 1             | 37                          | 26                       | 9          | 72              |
| Music-color,                                | 5                          | 1       | 15      | 9             | 2     | 3             | 3                           | 19                       | 10         | 64              |
| Color with Numerals,                        | 0                          |         | 0       |               | 0     |               | 0                           | 0                        | 14         | 14              |
| Color with Touches,<br>Tastes, Odors, Pain, | 0                          |         | 0       |               | 0     |               | 0                           | 0                        | 18         | 18              |
| Total,                                      | 19                         | 16      | 19      | 9             | 10    | 4             | 77                          | 73                       | 62         | 212             |

It should be added that among 40 cases of the occurrence of both letter and word-color, there are 13 in which the word-color is known to have been earlier in occurrence than the letter-color, while in only three cases the letter-color is remembered as earlier. From the summary it already appears that word-color is very susceptible of explanation through some actual experience, and, in fact, 10 of these 13 cases are wholly or partly explained by the subjects. It is possible, therefore, that these instances of letter-color are due to forgotten connection with natural word-associations.<sup>1</sup>

The prominence of association through emotional experience is marked, especially in regard to music-color. This agrees with the results of the earlier canvass<sup>2</sup> and seems to indicate that here, as in the case of so many psychological problems, the ultimate solution may be in unanalyzable terms of feeling. "Gay disposition, gay color," says one subject; "if I admire name or character, it is through liking for color." "It's

<sup>1</sup>Cf. *op. cit.* AMERICAN JOURNAL OF PSYCHOLOGY, V, 4, p. 447.

<sup>2</sup>Cf. *op. cit.*, AMERICAN JOURNAL OF PSYCHOLOGY, V, 4, p. 446.



the feeling I get from my music," another says; "I always imagine those colors with those emotions." "Things which make me happy," writes a third, "are always light pinks, blues and yellows, while sad things are always dark."

Many of these explanations are, of course, fragmentary and incomplete, and it is possible that some are mere instances of paramnesia or explanations after the event. It is just as likely, however, that many instances of the origin through ordinary association have been forgotten. Certainly the existence of any such natural explanations diminishes the necessity and the probability of the theory of physiological abnormality. Cases in which the experience is definitely useful or pleasant also favor the natural theory, and these are not inconsiderable in number.

## SUMMARY VII.

*Utility and Pleasurableness of Pseudo-chromesthesia.*

|  | YES.  |   | NO.   |   | Neither. | Both. | No Ans. | Total. |
|--|-------|---|-------|---|----------|-------|---------|--------|
|  | Sure. | ? | Sure. | ? |          |       |         |        |
| The subject's memory is helped,                  | 12    | 4 | 50    | 7 |          |       | 19      | 92     |
| The subject finds pleasure in "colored-hearing," | 44    | 7 | 3     | 1 | 24       | 5     | 8       | 92     |

There are few cases of assisted memory, but some of these are very marked, as, for instance, that of the student who says, "If I hear an opera, I can come home and almost play it by colors; I know what chords make a given combination of colors." The pleasurableness of the experience is very common, and might be a reason for the perpetuation of a color and sound association accidentally formed.

For the physiological theory the strongest argument is the undoubted hereditary tendency of synæsthesia. The answers to the questions bearing on this point are not summarized, since the subjects, who very likely have never heard of any colored-hearing or forms among members of their families, are so likely to reply by a rash "no" or by a misleading "doubtful." The frequent repetition of the experience within a family and its continuance from one generation to another are acknowledged, however, by all observers, and certainly suggest the existence of cerebral peculiarities. But these may be the result or the accompaniment, not the cause, of the synæsthesia, which may still be referred to use-

ful or pleasant associations. Cases in which the pseudo-chromesthesia rises to the stage of hallucination are also such as lend themselves readily to a cerebral explanation. These are presented in the next table, but it should be observed that the statistical method, even when supplemented, as in this case, by simple experiments, is peculiarly unfitted for an investigation of hallucination, since the questions themselves may suggest a false memory of hallucination; even so, the affirmative answers to these questions are few. They include cases in which a page seems to the reader actually tinged with the shade of the "colored" letter or word, as when one subject says, "The paper grows orange-pink as I look at *a* on a page;" and instances of after-images, like that of the student who answers, "Sometimes when I look up very quickly, I have the same color [as that of letters or word], when I don't want to have it at all."

It might also be urged that instances in which the color is in very distinct form and is very definitely located are more likely than the cases of shadowy and vague color to involve peculiar cerebral accompaniment. This conclusion is of questionable validity, but the figures bearing on these considerations are added and show that the color is usually in indistinct form, but almost always definitely located—generally, it may be added, in front of the subject.

## SUMMARY VIII.

*Form and Location of Color.**Hallucination.*

|           | Definite. | Indefinite. | No Ans. | Total. | YES.  |   |       | No.   |   |       | No Ans. | Total. |
|-----------|-----------|-------------|---------|--------|-------|---|-------|-------|---|-------|---------|--------|
|           |           |             |         |        | Sure. | ? | Total | Sure. | ? | Total |         |        |
| Form,     | 31        | 47          | 14      | 92     | 13    | 8 | 21    | 54    | 6 | 60    | 11      | 92     |
| Location, | 64        | 15          | 13      | 92     |       |   |       |       |   |       |         |        |

In conclusion, therefore, it may be said that our results do not demonstrate either theory of pseudo-chromesthesia to the exclusion of the other, but that they favor the "psychological" explanation through natural association, by proving the existence of some cases, at least, which demand this explanation.

Among the 171 persons who have forms, we find only 4 who are certain of any hallucination and 7 who answer by a doubtful affirmative. One of the rare cases in which the form is a positive hindrance seems to approach in its

vividness the plane of illusion : of a number form, which is a spiral prolonged to infinity, the possessor writes, "[my form] makes mathematics harder, for, *e. g.*, in algebra, when I must substitute  $\infty$  throughout an equation, I get so lost in the  $\infty$  that I can't get at it at all."

The explanations and the cases of usefulness are, however, very frequent ; the shapes are in most cases familiar, usually circles, rectangles or lines ; the turns of the number-forms in the great majority of cases are at the most prominent numerals, the 5's, the 10's and the 12's.<sup>1</sup> So it is in the highest degree probable that most of these forms originate in the self-helping, topographical imagination of children introduced to the intricacies of number and word series. The frequency of slight variations in the forms from year to year—bends to right instead of to left, or upward rather than downward—favors the theory of natural association by showing, as has been said, a connection with the adult, as well as with the childhood experience, a certain sensitiveness to changes in the methods of thought and of life. The physiological theory can hardly account, in so simple a manner, for these unimportant yet definite alterations.

## SUMMARY IX.

*Explanation and Utility of Forms.*

| Forms have                              | YES.  |    |                    | No. |            |                 | No Ans. | Total. |
|---|-------|----|--------------------|-----|------------|-----------------|---------|--------|
|   | Sure. | ?  | Total Affirmative. | No. | Hind-rance | Total Negative. |         |        |
| Explanation,                            | 98    | 31 | 129 (25.29%)       | 318 |            | 318 (= 62.35%)  | 63      | 510    |
| Utility,                                | 182   | 27 | 209 (40.98%)       | 243 | 6          | 249 (= 48.82%)  | 52      | 510    |
| Explanation,<br>or Utility,<br>or Both. |       |    | 278 (54.50%)       |     |            | 220 (43.13%)    | 12      | 510    |

The proportion of definite explanations is thus considerably greater than that of the earlier study,<sup>2</sup> and in view of the great probability of forgotten origins, the natural theory of forms seems overwhelmingly probable. "The nature of the month-form," one student writes, "is probably due to the

<sup>1</sup>Cf. *op. cit.*, AMERICAN JOURNAL OF PSYCHOLOGY, V, 4, p. 449.

<sup>2</sup>*Op. cit.*, AMERICAN JOURNAL OF PSYCHOLOGY, V, 4, p. 448.

nature of my school work. From January to June there is a gradual letting up of the strain; July and August are the calm months, and with September begins the up-hill work."

"My number-form," says another, "I can trace back to a game which I played in childhood. The figures were in small blocks." A third explanation refers the origin of the form to kindergarten days: "My number-form originates, I think, in those frames with colored beads strung upon wires, by means of which children are taught to count, add, subtract, etc."

The testimonies to the utility of the forms are no less explicit. These which follow are representative: "The only way I can remember dates is that other dates are proportional to them (on a form of concentric circles). I remember 1,625 because it is at an angle of  $30^\circ$  from the present." "I am almost entirely dependent on my form for remembering dates, appointments, people and places; and \* \* \* I think it would be impossible for me to add the smallest numbers without the aid of my number form." "My alphabet-form helps very much in type-setting." "When I said I would come here, I 'put it down' on my form."

The significant number of those who believe that they are helped by their forms to memorize facts, to remember dates and to perform mathematical operations, emphasizes the wisdom of such educational use of forms as has already been made by Miss Adelia Hornbrook.<sup>1</sup> Indeed, the use of charts and of diagrams is in itself a suggestion of mental forms, for calendars and primer pages lie at the basis of many month, week and alphabet forms. To make these suggestions more definite, and, in particular, to impress the child's memory, as Miss Hornbrook does, with some simple number-form, seems a reasonable, pedagogical application of these forms. Such aid to the visual imagination might not aid the essentially "ear-minded" children, but it could do no harm unless unduly pressed.

The elaborate dramatization of letters, numerals and musical notes,<sup>2</sup> by which they are endowed with physical and with psychical characteristics, so that they often become actors in entire little dramas among themselves,—this complex experience may probably be referred to the commoner and simpler phenomenon of especial like or dislike for certain letters or numbers. All these cases may be classified as follows :—

<sup>1</sup>*Educational Review*, V, p. 467.

<sup>2</sup>*Op. cit.*, *AMERICAN JOURNAL OF PSYCHOLOGY*, V, 4, p. 454.

SUMMARY X.  
*Personification.*

| Forms of Personification. | Yes. | No. | Total. |
|---------------------------|------|-----|--------|
| Like or Dislike,          | 75   | 8   | 83     |
| Dramatization,            | 46   | 37  | 83     |

Examining more closely these instances of like and dislike, we find that there are fifty per cent. more such associations with the numerals than with the letters, which indicates that the numerals, as objects of more intense intellectual effort, are more likely to become factors of emotional association. Still more carefully observed, these numerical associations disclose the existence of a marked preference for the even numbers.

SUMMARY XI.  
*Even and Odd Numbers.*

| Numbers.  | EVEN NUMBERS. |                |        | ODD NUMBERS. |                |        | Indefinite Ans. | Letters only Liked, etc. | Total Liked and Disliked. |
|-----------|---------------|----------------|--------|--------------|----------------|--------|-----------------|--------------------------|---------------------------|
|           | Even Only.    | Even with Odd. | Total. | Odd Only.    | Odd with Even. | Total. |                 |                          |                           |
| Liked,    | 22            | 12             | 34     | 12           |                | 12     | 21              | 8                        | 75                        |
| Disliked, | 4             |                | 4      | 38           | 3              | 41     | 14              | 16                       | 75                        |

There seems to be a special fondness for 2, and—among the odd numbers—for 5, but a common aversion for prime numbers like 7, 11 and 13. One would almost certainly infer that these feelings have their root in the actual experience of facility in the use of even numbers, and of difficulties with the unyielding indivisibility of prime numbers, and the explicit testimony of one-fourth of our subjects confirms this view. In these cases of personification, therefore, as well as in the other forms of synæsthesia, the “psychological” theory seems the simpler and the more probable.

QUESTIONS ON SYNÆSTHESIA.

These questions are based upon a list formulated after the careful study of more than 80 records of synæsthesia. They have been re-cast after the experience gained by using them during two years,

for 200 subjects, and after the addition of questions suggested by Flournoy's and by Gruber's classification.

Questions which seem to the writer of secondary importance in the theoretical consideration of the subject, though necessary to a complete description, are starred.

It is suggested that the first step in a systematic investigation of synæsthesia should be to ask the preliminary questions which demand simple "Yes" and "No" answers. When the replies have been sifted, the more detailed questions may be sent to all who have answered affirmatively. Canvasses of men's colleges, or college classes, of associations of people in middle life, of schools of children and young people, and of the accidentally blind and deaf, would yield especially valuable results. Materials and more detailed suggestions for such inquiries will be supplied, and the results gladly received by

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## SYNÆSTHESIA.

### PRELIMINARY QUESTIONS.

Answer by "Yes," "Yes?", or "No." Do not fail to answer "Yes?" *not* "No," if in any doubt.

I. Do you think of particular colors in connection with letters of the alphabet, or numerals, or proper names, or musical sounds, or in any other unusual connection?

II. Do you think of numerals, or names of months, days or years, or of any series of words, as arranged in particular shapes, like circles, squares, zig-zags, or very long lines?

III. Do single numerals, letters, musical notes, etc., make you think of different shapes?

IV. a. Do you especially like or dislike any numerals, letters, etc.?

b. Do numerals, letters, etc., seem to you to be like people?

### DETAILED QUESTIONS.

*Note.*—Many of these questions may be answered by "Yes" or "No," but fuller replies are preferable. It is hoped that all questions will be answered, but the less important ones are starred.

#### A. *Pseudo-chromesthesia.*

I. Do you habitually or frequently "seem to see" colors or variations of light and shade, in connection with certain letters, words, objects, sounds, or other sensations? If so, mention the colors connected,

a. With letters.

1. With vowels.

ä (as in fäte), ä (fät), ä (fär).

ē ( " mē), ē (mēt).

ī ( " mine), ī (pīn).

ō ( " mōte), ō (nōt).

oo ( " moon).

ū ( " mūte), ū (tūb).

ȳ ( " tȳpe), ȳ (sȳmbol).

2. With diphthongs.  

|    |    |    |    |    |    |     |
|----|----|----|----|----|----|-----|
| æ  | au | ay | ei | ew | œ  | ou  |
| ai | aw |    | eu | ey | oi | ow. |
3. With consonants.  

|   |   |
|---|---|
| b | d |
| c | f |

etc. (Mention all cases.)
- b. With words.
  1. Names of people. (Mention instances.)
  2. Names of places. (Mention instances.)
  3. a. Names of months. (Mention all cases.)  
 b. Names of days of week. (Mention all cases.)
  4. Common terms.
    - a. With all words, or with a few?
    - b. With any particular parts of speech?
    - c. With abstract terms?
- c. With sounds.
  1. With musical sounds.
    - a. Different pitches.
      - (1) High.
      - (2) Low.
    - b. Different intensities.
      - (1) Loud.
      - (2) Soft.
    - c. Different keys. (Mention all cases.)
    - d. Different instruments, *e. g.*, violin, piano. (Mention all cases.)
    - e. Different composers, *e. g.*, Chopin, Handel.
    - f. Different pieces of music.
  2. With noises. (Mention all cases.)
  - d. With numerals, *e. g.*, 1, 3, 9. (Mention all cases.)
  - e. With pictures or objects, which are
    1. Still.
    2. In motion.
  - f. With tastes. (Mention all cases.)
  - g. With odors. (Mention all cases.)
  - h. With skin sensations. (Mention all cases.)
    1. Contact.
    2. Pressure.
    3. Temperature.
    4. Sensations of movements.
  - k. With pains. (Mention all cases.)

Answer questions II and III with reference to each sort of color: that for letters, words, music, numerals, tastes, etc.

\*II. a. Does the color appear

1. *Only* when the letter (word, music, etc.) is *heard*?
2. *Only* when the letter (word, music, etc.) is *seen*?
3. *Both* when the letter, etc., is *heard* and *seen*?

*Note.*—Which seems to have been earlier, color with sound or with form?

b. Does the color appear

1. When the letter, etc., is imagined as *heard*?
2. When the letter, etc., is imagined as *seen*?
3. In both cases?

c. Does the color appear invariably or occasionally?

\*III. What is the location of the color?

- a. Is it in tridimensional space, *e. g.*, in front of you, to the right, etc.? or,

- b. Is it as if on a page ? or
- c. Is it impossible to give the location ?
- \*IV. What is the *shape* or *form*
  - a. Of color with music and noises ?
  - b. Of color with tastes, etc. ?
  - c. Of color with letters and numerals:—
    - 1. Does each letter and numeral appear as if printed or written in colored ink ? or,
    - 2. Has the color some other definite shape ? or,
    - 3. Has the color a vague and indefinite shape ?
  - d. Of color with words:—
    - 1. Is each letter colored separately ?
    - 2. Are all letters colored, but of one color ?
    - 3. Is the word printed or written, in a neutral tint on a colored background ?
    - 4. Has the color some other definite shape ?
    - 5. Has the color a vague and indefinite shape ?
- V. (If you have word color)
  - a. Give your color for
 

|             |               |
|-------------|---------------|
| 1. Sara.    | 9. a. Carrie. |
| 2. Lottie.  | b. Carry.     |
| 3. Date.    | 10. Alice.    |
| 4. Harry.   | 11. Edith.    |
| 5. Samuel.  | 12. Oscar.    |
| 6. Fate.    | 13. Anna.     |
| 7. Door.    | 14. Stephen.  |
| 8. a. Meet. | 15. Clifford. |
| b. Meat.    |               |
  - b. How does the color of a word seem to you to be determined ?
    - 1. Does it follow the color
      - a. Of the initial letter ?
      - b. Of a repeated letter ?
      - c. Of a vowel or of vowels ?
      - d. Of a consonant or of consonants ?
      - e. Of an accented vowel or consonant ?
    - 2. Does each letter have its own color as when perceived alone ?
    - 3. Is the color a mixture of the colors of the different letters ?
    - 4. Does the color follow the prevailing sounds, so as to be the same for rhymed words ?
  - c. Was word-color earlier than letter-color ?

Answer question VI with the fullest details possible.

- VI. a. Have you any explanations of your colors, by association,
  - e. g.,*
    - 1. Of the *letters*, with the colors of blocks or pictures from which they were learned ?
    - 2. Of the *numerals*, with some similar objects ?
    - 3. Of *names of people*, with the color of hair, or of eyes, or of garments of particular people ?
    - 4. Of *names of places*, (a) With colors of a map ?  
(b) With varying colors of foliage, etc. ?
    - 5. Of names of months with season-colors ?
    - 6. Of favorite letters or words with favorite colors ?
- Note.*—Name your favorite colors.
  - 7. Of musical tones with emotions, and so with colors producing the same emotions ?
  - 8. Of musical selections with the colors of real or imagined scenes ?



- b. Mention any other explanations for the origin or for the alteration of your colors.
- VII. a. Do your "colored" words aid your memory in spelling?
- b. Do your "colored" notes aid your memory for music?
- c. Are your colors of any other assistance? (Give full details.)
- VIII. Is your pseudo-chromesthesia a source of
  - a. Pleasure? or
  - b. Pain? or
  - c. Neither? or
  - d. Partly of pleasure, partly of pain?
- IX. Have any of your immediate family or other relatives
  - a. Pseudo-chromesthesia (colored hearing)?
  - b. Forms?
  - c. Any similar habit?
- \*X. Did your pseudo-chromesthesia begin
  - a. In childhood? or
  - b. Later? or
  - c. Part at one time, part at another? (Give details.)
- \*XI. Has your pseudo-chromesthesia
  - a. Increased? or
  - b. Decreased? or
  - c. Neither? or
  - d. Part increased and part decreased? (Give details.)
- XII. a. Is your pseudo-chromesthesia so strong that
  - 1. If you hear, read, or imagine one of your "colored letters," words, etc., while looking at a white background, the white becomes colored?
  - 2. You have an after-image of the color?
  - 3. A page on which your "colored" words, etc., are printed seems flecked with the color?
  - 4. The "color" of a name actually seems to intensify or to change the color of the dress of the wearer?
- b. Mention any other cases in which your pseudo-chromesthesia ever becomes or tends to become hallucination.
- XIII. Have you any such peculiar associations
  - a. With sounds? *e. g.*, do colors suggest musical notes?
  - b. With tastes, odors, etc.? *e. g.*, do musical notes suggest tastes, odors, etc.?
- \*XIV. Mention any personal details which bear on the subject, *e. g.*,
  - a. Are you, in any sense, an artist?
  - b. Are you, in any sense, a musician?

*B. Forms.*

- I. a. Draw your forms for *series* of words, numerals, etc.
 

|   |   |  |
|---|---|--|
| <ul style="list-style-type: none"> <li>1. For numerals.</li> <li>2. For months.</li> <li>3. For days of the week.</li> <li>4. For years or centuries.</li> <li>5. For the alphabet.</li> <li>6. For any other forms.</li> </ul> | } | Indicate the position on each form of numerals, names of months, letters, etc. |
|---|---|--|
- b. Draw your symbols, if you have any, *i. e.*, forms for single numerals, letters, etc.
  - 1. For numerals, *e. g.*, 1 =  $\triangle$  2 =  $\circ$  3 =  $+$  4 =  $\xi$
  - 2. For letters.
  - 3. For musical notes.
  - 4. For words.
- \*II. Please state with reference to each form whether

- a. The numerals, names of months, etc., appear as if printed (or written) on the form.
- b. The form is colored.
- c. Any images of scenes or of objects appear in the forms.
- \*III. Please state with reference to each form and symbol, whether
  - a. The form, etc., is flat, like a plane surface.
  - b. The form, etc., is flat, as if printed on a page.
  - c. The form, etc., extends in three dimensions.
- \*IV. Please state with reference to each form and symbol, whether
  - a.
    - 1. The form, etc., is in front or back of you.
    - 2. The form, etc., is above or below you.
    - 3. The form, etc., is right or left of you.
  - b. You always imagine yourself in relation to the form, etc.
- \*V.
  - a. Do the forms appear invariably or occasionally ?
  - b. Do the forms appear as wholes or in sections ?
- VI. Have you any explanations of the origin or of the particular shape of your
  - a.
    - 1. Number-form ?
    - 2. Month-form ?
    - 3. Day-of-week-form ?
    - 4. Year or century-form ?
    - 5. Alphabet-form ?
    - 6. Other forms ?
  - b. Symbols (single forms for numerals, etc.).  
 Can you refer any forms or symbols to lessons or games of childhood ? Are they like any pattern of wall paper or carpet ? like a calendar ? like a clock face ? etc.
- VII.
  - a. Does your number-form help you
    - 1. In remembering dates ?
    - 2. In any mathematical operation ?
    - 3. In any other way ?
  - b.
 

|   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>1. Does your month-form</li> <li>2. Does your day-of-week-form</li> <li>3. Does your year or century-form</li> </ul> | } | help you in remembering dates or appointments ? |
|---|---|---|
  - c. Does your alphabet-form help you
    - 1. In spelling ?
    - 2. In looking up words in a lexicon ?
    - 3. In any other way ?
  - d. Does any other form help you ?
  - e. Do your symbols help you ?
- \*VIII. Does the possession of the forms and symbols give you
  - a. Pleasure ?
  - b. Pain ?
  - c. Neither ?
  - d. Partly pleasure and partly pain ?
- IX. Have any of your immediate family and other relatives
  - a. Pseudo-chromesthesia (colored-hearing) ?
  - b. Forms or symbols ?
  - c. Any similar mental habit ?
- \*X. Did your forms and symbols begin
  - a. In childhood ?
  - b. Later ?
  - c. Part in childhood, part later ?
- \*XI. Have your forms and symbols
  - a. Increased ?
  - b. Decreased ?
  - c. Neither ?
  - d. Part increased and part decreased ?

- XII. a. Do you ever feel as if the forms and symbols had an actual, external existence ?  
 b. Do they ever involve you in any other sort of hallucination ?  
 \*XIII. Mention any personal details which bear on the subject, *e. g.*,  
 a. Are you an artist ?  
 b. Are you an architect ?  
 c. Are you especially fond of system and method ?

*C. Personification.*

- I. Like and dislike  
 a. For numerals.  
 1. Do you especially like any numerals ?  
 2. Do you especially dislike any numerals ?  
 Give reasons in both cases.  
 b. For letters.  
 1. Do you especially like any letters ?  
 2. Do you especially dislike any letters ?  
 Give reasons in both cases.  
 c. Mention and explain any similar cases of like and dislike.  
 II. Dramatization.  
 a. With numerals.  
 1. Do numerals seem to you to have physical characteristics ?  
 (*e. g.*, is 1 short and fat, 4 tall and thin, 7 brunette ?)  
 2. Do numerals seem to you to have mental and moral characteristics ? (*e. g.*, is 8 upright, 14 mean, 16 kind ?)  
 Give reasons for all cases.  
 3. Is the dramatization so complete that the numerals seem like persons ? (Give details.)  
 b. 1. Do letters seem to you to have physical characteristics ?  
 2. Do letters seem to you to have mental and moral characteristics ?  
 Give reasons for all cases.  
 3. Is the dramatization so complete that the letters seem like persons ? (Give details.)  
 c. Mention and explain any similar cases of dramatization.  
 D. Mention any other cases of peculiar association.